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ABSTRACT

A study of the relationship between the behavior of preschool children (3-5-year age group) and the physical near environment has been initiated at Cornell. The illumination and sound levels, color, equipment, and spatial configurations in a nursery school room are to be varied, and systematic observational records will be kept of the level of play, the incidence of aggression, and the movement in and out of, as well as the movement within, the test area. (Author)

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THE PRE-SCHOOL CHILD NEAR ENVIRONMENT: VARIABLE MANIPULATION AND EVALUATION

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Abstract A study of the relationship between the behavior of pre-school children and the physical near environment has been initiated at Cornell. Illumination and sound levels, color, equipment, and spatial configurations in a nursery school room will be varied. Systematic observational records will be kept of the level of play, the incidence of aggression, and movement in and out of, as well as within, the test area.

Introduction The 3-5 year age group displays particular activities, behavioral patterns, social relationships and interests that might be influenced by interior space. The effect of the near physical environment has not been well documented. Were it available, information about the effects of modifying aspects of the environment might be used to establish criteria for the design of day-care centers, schools, playgrounds, institutions and even residences.

This study does not pretend to gather information on so massive a scale. Since the nature of the input in an ongoing nursery school environment includes so many human and social interaction variables, the scope of a study such as this becomes very quickly restricted by methodological and time considerations. It is our intention to conduct a pilot study first, in which as many relevant variables as possible are controlled.

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Objective criteria or determinants for design direction have been scarce, and the intuitive approach prevails. It is intended that ties between designers and psychologists will be strengthened by research efforts of this type. Exchange of data, feedback on evaluation of environmental variation, and the indication of trends for further study are vital in encouraging behavioral science-design integration.

The profession of interior or environmental design is experiencing an increasingly rapid and desirable move toward more objective design criteria and human environment performance standards. The assumption that the designer, with his experimental intuitive approach, is adequately equipped to solve the majority of design problems encountered is now being questioned. Because of the increase in design-behavioral science communication, the designer will find it necessary to be better grounded in the knowledge of the behavioral scientist as well as in the knowledge of the structural engineer. The designer's activity will be concerned with developing and using a methodology that permits coordination and communication with the interacting disciplines. Variations in language and methodology make this task difficult. The designer's objective will then become a merging of environmental science and environmental psychology in regard to environmental needs; he will attempt to merge human and social factors with a design focus.

The need for the design profession to become familiar with the methods and goals of the social sciences is gradually being given more widespread credence, helped along by popular concerns and human-centered design concern. Many design educators recognize this need and are attempting to orient their curriculum in this direction. There is an unfortunate dichotomy between the scientific methodology of behavioral science and the intuitive approach of the traditional designer. The role of psychology in design is to identify some of the effects of the environment on behavior, and provide relevant behavioral data for the designer.

Design effectiveness of the near environment in meeting functional criteria is defined in terms of human behavior or performance. The design process should encourage development of the feedback loop so that the designer can know how adequately his predictions and decisions meet the program needs. Feedback would contribute to building up a body of knowledge about solutions which, combined with the body of knowledge in human and social factors, would enable the designer to provide a better service. The design profession has concentrated primarily on hardware or object design, and lacks accurate, reliable information on performance factors. Knowledge about performance and human needs, or software research, should precede hardware formulation.

The present study will be primarily concerned with behavioral-environmental relationships. One of the factors determining our focus was the lack of research that has been done with pre-school children in a manipulated environment. While some studies have described behavior in existing environments, little research has been conducted on how the same children behave when environmental variables in the same location are altered.

The large number of child care facilities that are either existing or planned make the need for research on the effects of the physical environment on Children's behavior especially pressing. It is likely that a drastic increase in child care centers will result if Congress passes the Child Development Act. Yet an organized body of knowledge for designers and nursery school personnel based on substantial environment-behavior research is still non-existent.

In the area of color, few criteria are available other than the designer's or client's subjective preferences. Several investigators (see Bayes, 1967) have found that up to the age of about six years the warm colors - red, yellow, orange - are preferred to the cool colors. Younger children appear to prefer red and change their preference to blue at an older age.

In a study of children from ages five to nine tested at two-year intervals, Frieling found likes and dislikes more extreme for the younger children. The youngest liked red and magenta and the 5-10 year olds had a strong dislike for black. He noted an enthusiasm for full chromas and strong pure color, and at all ages a dislike of neutral colors whether in dark or light range.

Color preferences of mentally subnormal or emotionally disturbed children have not been subject to much study. One study cited by Bayes (1967) found that children, when supplied with interchangeable desk tops, preferred red desk tops early in the morning and during the beginning of the week, but during the latter part of the day and the week chose yellow, blue and green. Green and yellow were found most in demand for creative lessons; red tops were correlated more highly than the others with destructive activity such as scribbling and carving.

Grazma and Witt (1969) ran trials on 35 nursery school children during which they were allowed to play with red, blue, green, and gray blocks presented in varied spatial array. Position preferences appeared to be more important than color preference in the selection of blocks.

In the physical design of nursery schools or day care centers, color selection and determination of equipment and environment is a necessary part of the planning process. Most color selection decisions are based on highly subjective opinions, "soft research", or very casual information. The most objective data related to color that are currently available are concerned with glare (reflectance factors of a given color or surface), maintenance of a given color, and color fastness.

However there is no similar information available to nursery school or day care center personnel designers or architects than can be used to actually guide men in choosing color for different effects.

Subjects

Three-year old and four-year old children attending the Cornell University Nursery School will participate in the study. While the nursery school has tried to attract a diverse group of children, the majority of the children are white, middle class, and many are children of Cornell staff and faculty.

Test Environment The study is being conducted at the New York State College of Human Ecology, Cornell University, by the Departments of Design and Environmental Analysis and Human Development and Family Studies. A special room has been prepared at the Cornell Nursery School.

Since behavioral development occurs in real social settings rather than in the isolation of the laboratory, the plan was to use a real-life setting (e.g., a nursery school room), but to make the environment changeable in a systematic way, thus obtaining some control over variables in a natural situation. By systematically varying one aspect of the environment at a time, and recording observation of selected aspects of the children's behavior, the effect of each variable might be teased out.

The major test area is in a 16 by 20 foot room within the nursery school normally used by the 3 year old group as a locker and general activity room. This room has been equipped with a pendant light track system with light fixtures, which can be moved back and forth and adjusted to direct its light to any position. The lighting system is equipped with dimmer switches which will permit changes in the illumination level for 0 to 100 footcandles. Color filters have been provided for the fixtures, to use in a portion of the color environment study.

The illumination follows the established IES format for footcandle measurement. Folding partitions, 4 feet by 4 feet, have been constructed to provide the needed space formations and divisions. Some of the panels are curved to help create a more free-form space when desired. The partitions have been constructed so as to accommodate panels of various colors. These panels can be slid in and out of the partitions to create a color change in the space surfaces. Panels with acoustical tile attached, which also can be slid in and out of the partitions, have been provided. Provisions are made also for hanging some of the panels on the surrounding walls, if needed for further sound absorption.

All panels, except the color panels, the partitions, and visible walls have been painted white in order to create a more neutral or "colorless" environment. White surfaces also provide a "purer" base for the colored light experiments. Carpet tile will be installed at various stages during the sound tests when maximum sound reduction is desired.

A series of 8 in. and 6 in. high by 8 ft. long individual "steps" have been constructed, that can be combined to form graduated seating levels. These steps can be arranged into various groupings, in order to create areas for group activities (e.g., story telling) that might help focus the children's attention and behavior on the ongoing activity.

In order to study the effects of height of furniture on a child's activities, several tables have been constructed. The experimental tables are identical to the other furniture in the nursery school room in all aspects except height. While the typical tables in a 3-year old group are 20 in. high, the newly constructed tables are 10 in. high.

In addition, separate small pieces of furniture, square, rectangular and curved, at 20" height were constructed to be used along with different geometric relationships of the partitions. The partitions can be equipped with a blackboard, cork or flannelboard tack surface. They can be used to create a "learning center" where an individual child, can work alone or with a teacher. While such learning areas have been used in many nursery schools their actual effectiveness has not been determined systematically.

Evaluation. In order to facilitate an investigation of the effects of the lighting on the children's behavior, only three levels of illumination (High, Medium, and Low) will be manipulated. In the Medium level condition, the overhead lighting system will be adjusted so as to produce approximately the amount of light typically found in the particular room in which the study will be conducted. In the low condition, illumination will be considerably dimmer. Illumination levels will be monitored during each observation period by a light meter, so as to maintain consistency over the experimental sessions.

The pilot project on the effects of illumination will involve 36 days of one-hour observation sessions. The categories of behavior to be observed under the different light intensities are: 1.) aggressive behavior, using definitions adapted from Sears (1951), 2.) social participation, using definitions adapted from Parten (1943), and 3.) frequency and duration of time spent in each play area.

Observations of the children's behavior will be made during the same hour everyday (in the morning). During this hour, the level of illumination will be changed once by one of the experimenters, either 20 minutes, or 40 minutes after the beginning of the hour. Therefore, during any one hour of observation only two levels of illumination will be used.

The six possible combinations of lighting levels (High, Medium, High-Low, Medium-High, Medium-Low, Low-High, and Low-Medium) will be varied randomly over the 36 days of observations, with the restrictions that each combination must occur equally often (six times), and that each combination will conform to the 20-minute/40-minute time schedule three times, and to the 40-minute/20-minute time schedule three times.

After the data have been collected, the behavior measures can be compared across pooled lighting conditions, or specific combinations of the conditions.

The treatment of the data will be a simple comparison of the frequency of each category of behavior as the lighting is varied. Observations of individual children will be made for 5-minute time samples. As the children will be free to go in and out of the test room it will also be necessary to record how many children are present though not all can be observed every day.

Essentially, the effects of the graduated seating levels will be investigated by varying the presence or absence of a two-level seating combination. A group activity, such as story telling, will be initiated at about the same time every morning, following the one-hour observation session. The group activity session will last approximately ten minutes, with the seats being present on half of the 36 days, and absent on the other half of the days. Selected aspects of the children's behavior related to their attention to the activity will be observed, and records will be kept of the number of children approaching and leaving the activity area.

The research currently underway at Cornell involves pilot work on the effects of two of the variables previously discussed: illumination and graduated seating levels. These variables were selected for initial study because they are relatively easy to manipulate. The studies of space, color and sound will follow.

A parallel study conducted by several graduate students in the Environmental Analysis program will be occurring at the same time. Data will be recorded by means of videotape and observation at the Cornell Nursery School, as well as at several other child care locations. Children with similar background will be observed in a variety of physical environments, and data collected to see what behavior differences are noted in the varied environments.

Future Research

Since this is intended as an exploratory study, considerable ground is left to be covered. Possible topics for future investigation are the effects of volume changes (i.e., height in addition to width, length and shape) and sensory deprivation (a total white environment, for example). A study of environmental influence related to different economic and social backgrounds would be of particular benefit to day-care centers.

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